

REMARKS

The Examiner is thanked for the performance of a thorough search. The Examiner is also thanked for the allowance of Claims 27 and 90, and for indicating that Claims 5-8, 17-18, 20-24, 57-59, 69-72, 80-81, 83-87, and 94-96 contain allowable subject matter.

I. STATUS OF CLAIMS

Claims 27 and 90 stand allowed.

Claims 5-8, 17-18, 20-24, 57-59, 69-72, 80-81, 83-87, and 94-96 are indicated as containing allowable subject matter and would be allowable if re-written in independent form including all of the limitations of the base independent claim and any intervening claims.

Claims 2, 3, 10, 14, 26, and 58 are amended herein to correct informalities and typographical errors and not for the purpose of overcoming prior art. No claims are added or canceled. Hence, Claims 2-8, 10-27, and 54-102 are pending in the application.

II. SUMMARY OF THE REJECTIONS

Claims 2-4, 10-16, 19, 25-26, 54-56, 60-65, 66-68, 73-79, 82, 88-89, 91-93, and 97-102 have been rejected under 35 U.S.C. § 102(b) as allegedly anticipated by Courts et al., U.S. Patent No. 5,636,360 ("COURTS").

III. RESPONSE TO THE REJECTIONS

A. INDEPENDENT CLAIMS 2 AND 4

Independent Claims 2 and 4 have been rejected under 35 U.S.C. § 102(b) as allegedly anticipated by COURTS.

Among other features, Claims 2 and 4 comprise the feature of:

storing, in a storage space, **undo information for removing changes that are being made to data** by a plurality of entities, *wherein application of the undo information returns the data to which the changes were made to a state of the data that existed prior to the changes*, wherein the undo information for each entity of the plurality of entities is stored in a segment of a plurality of segments within said storage space.

It is respectfully submitted that COURTS does not describe the above feature of Claims 2 and 4.

1. Brief Overview of COURTS

COURTS describes a method for logging transactions which alter a file system stored on a secondary storage device, such as a hard disk. (COURTS, Abstract.) In COURTS, a modification made to data in a file system typically occurs as a sequence of changes to individual blocks on the disk. (Col. 1, lines 28-30.) COURTS considers such a modification as a transaction, which may be defined as an operation that takes the file system from one consistent state to another consistent state. (Col. 1, lines 30-32.)

The problem solved by the method described in COURTS is related to cache buffer schemes. A disk cache buffer scheme allows faster access of hard disk data by caching or storing some of the disk data in RAM. However, the use of the buffer cache makes the file system prone to data inconsistencies in the event of abnormal system shutdowns. (COURTS, col. 1, lines 21-27.) Specifically, in the disk buffer cache scheme, modified disk data is written from the buffer cache to the disk only when the data is forced out of the buffer cache. Therefore, the sequence of changes to disk data made by transactions may be vital in maintaining the data consistency of the file system. (COURTS, col. 1, lines 33-36.) For example,

if the transaction has 3 steps, change in step 3 that is dependant on step 2 could be written to disk while the change in step 2 remains in the cache. In the event of an abnormal system shutdown, the change to disk data in step 2 would be lost, yet the change in step 3 would be saved. This causes the disk to be left in an inconsistent state. (COURTS, col. 1, lines 42-48.)

COURTS addresses the above problem by providing a log buffer for recording transactions against the file system. The log buffer is stored in RAM, and the contents of the buffer are copied to a log partition that resides on disk. (COURTS, col. 2, lines 11-16; see also FIG. 1.) After an abnormal system shutdown, the contents of the log partition are copied to the buffer cache in the same sequence as the transactions are logged in the log buffer (COURTS, col. 2, lines 26-28 and lines 38-40), and the buffer cache continues to operate in its normal way to write to disk the modified disk data that has not yet been stored on the disk.

2. COURTS does not describe the undo information feature of Claims 2 and 4.

The Office Action states that the log buffer in COURTS is equivalent to the storage space feature of Claims 2 and 4, and that a log buffer entry is equivalent to the segment feature of the claims. Further, the Office Action asserts that COURTS describes undo information in col. 3, lines 50-67. This assertion is incorrect.

In col. 3, lines 50-67, COURTS states:

Continuing to refer to FIG. 1, an overview of the disk file system logging system and method is shown. Logging is accomplished by using two main logging structures, log buffer 101 and log partition 102, which reside in RAM 12 and on disk 14, respectively. Log buffer 101 may also reside in a non-volatile RAM in an alternate implementation. For reasons obvious to a person skilled in the art, only transactions which consist of writing to disk are at issue in the buffer cache scheme and will be discussed below. **As transaction 15 writes data to buffer cache 11, a copy of the data is also recorded in log buffer 101, as shown by path 103. The data are recorded sequentially therein along with enough information that if a crash occurs, the data can be restored to disk 14.** However, because log buffer 101 is located in RAM 12, its content is still subject to loss in an abnormal shutdown. Therefore, the

contents of log buffer 101 are copied to log partition 102 whenever log buffer 101 is substantially full along path 104. (Emphasis added.)

The highlighted portion of the passage above clearly indicates that the log buffer in COURTS records **a copy of the data** that is written by a transaction in the buffer cache. Further, the copy of the data is recorded sequentially along with enough information such that if a crash occurs **the data can be restored to disk**. In other words, COURTS records in the log buffer the changed data itself, and NOT information for removing changes made to the data. Further, the additional information stored in the log buffer of COURTS is something like “REDO” information; such “REDO” information allows the ROLLING FORWARD of any changes to the data by restoring in the buffer cache (from the log partition) any changed data that was not written to the disk prior to the abnormal system shutdown.

In contrast, Claims 2 and 4 recite **undo information for removing changes that are being made to data**. Further, Claims 2 and 4 also recite that *application of the undo information returns the data to which the changes were made to a state of the data that existed prior to the changes*. In other words, the undo information featured in Claims 2 and 4 is used to ROLL BACK any changes that were made to data and to return the data to a state that existed prior to the changes.

It is respectfully submitted that COURTS describes no such undo information. Specifically, COURTS does NOT teach, describe, or suggest that a log buffer may store any information that is used to roll back any changes that are being made to the data on the disk. While COURTS may be describing buffer cache information that may be used to roll forward to disk changed data that has already been stored in the buffer cache, it is respectfully submitted that such information is fundamentally different from the undo information featured in Claims 2 and 4.

Finally, it is noted that, contrary to the assertions in the Office Action, COURTS does not teach, describe, or suggest several other features of Claims 2 and 4. However, due to the fundamental difference already identified, to expedite the positive resolution of this case a separate discussion of those features is not included at this time.

For the reasons given above, COURTS does not teach all features of Claims 2 and 4. Thus, it is respectfully submitted that Claims 2 and 4 are patentable under 35 U.S.C. §102(b) over COURTS. Reconsideration and withdrawal of the rejections of Claims 2 and 4 are respectfully requested.

B. INDEPENDENT CLAIM 54

Independent Claim 54 has been rejected under 35 U.S.C. § 102(b) as allegedly anticipated by COURTS.

Claim 54 includes a feature similar to the feature discussed above with respect to Claims 2 and 4. For this reason, it is respectfully submitted that Claim 54 is patentable under 35 U.S.C. §102(b) over COURTS for at least the reasons given above with respect to Claims 2 and 4. Reconsideration and withdrawal of the rejection of Claim 54 are respectfully requested.

C. DEPENDENT CLAIMS 3, 10-16, 19, 25-26, 55-56, 60-65, 67, 73-79, 82, 88-89, 92-93, AND 97-102

Dependent Claims 3, 10-16, 19, 25-26, 55-56, 60-65, 67, 73-79, 82, 88-89, 92-93, and 97-102 have been rejected under 35 U.S.C. § 102(b) as allegedly anticipated by COURTS.

Each of Claims 3, 10-16, 19, 25-26, 55-56, 60-65, 67, 73-79, 82, 88-89, 92-93, and 97-102 is dependent from one of independent Claims 2, 4, and 54, and thus includes each and every feature of the corresponding independent claim. Thus, each of Claims 3, 10-16, 19, 25-26, 55-56, 60-65, 67, 73-79, 82, 88-89, 92-93, and 97-102 is allowable for the reasons

given above with respect to Claims 2, 4, and 54. In addition, each of Claims 3, 10-16, 19, 25-26, 55-56, 60-65, 67, 73-79, 82, 88-89, 92-93, and 97-102 introduces one or more additional features that independently render it patentable. However, due to the fundamental differences already identified, to expedite the positive resolution of this case a separate discussion of those features is not included at this time. Therefore, it is respectfully submitted that Claims 3, 10-16, 19, 25-26, 55-56, 60-65, 67, 73-79, 82, 88-89, 92-93, and 97-102 are allowable for at least the reasons given above with respect to Claims 2, 4, and 54.

IV. CONCLUSION

The Applicants believe that all issues raised in the Office Action have been addressed. Further, for the reasons set forth above, the Applicants respectfully submit that allowance of all pending claims is appropriate. Therefore, the issuance of a formal Notice of Allowance is believed next in order, and that action is most earnestly solicited.

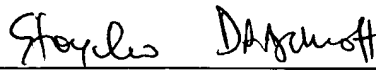
The Examiner is respectfully requested to contact the undersigned by telephone if it is believed that such contact would further the examination of the present application.

A petition for extension of time, to the extent necessary to make this reply timely filed, is hereby made. If applicable, a law firms check for the petition for extension of time fee is enclosed herewith. If any applicable fee is missing or insufficient, throughout the pendency of this application, the Commissioner is hereby authorized to charge any applicable fees and to credit any overpayments to our Deposit Account No. 50-1302.

Respectfully submitted,

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